



**National  
Transportation  
Safety Board**

# **Sleep and Sleep Disorders in Transportation Safety: Challenges and Opportunities**

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Board Member**

**State Sleep Medicine Conference  
Yale School of Medicine  
February 19, 2014**

# Federal Agencies: Transportation

NTSB

FMCSA

FRA

NHTSA

PHMSA

DOT

MARAD

FTA

FHWA

FAA



NTSB



NTSB



- 1) determining the probable cause of transportation accidents**
- 2) making recommendations to prevent their recurrence**







All Modes

# PG&E/San Bruno Gas Pipeline Explosion

- 8 fatalities
- 10 serious injuries
- 48 minor injuries



- 108 homes affected
  - 38 destroyed
  - 17 sev - mod damage
  - 53 minor damage



NTSB

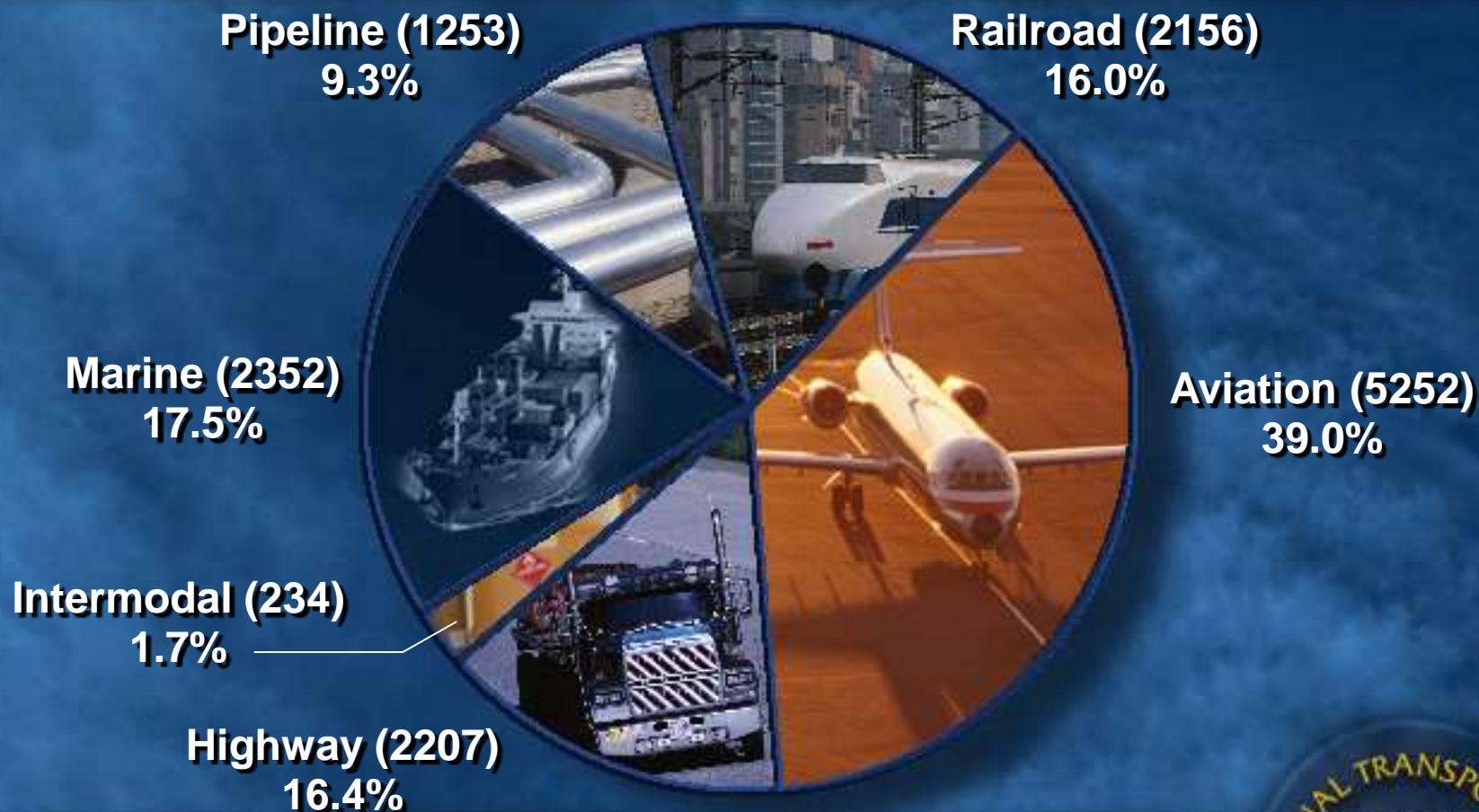


# Independent Federal Agency: Created in 1967

- >132,000 accident investigations
- 13,500+ safety recommendations
- ~ 2,500 organizations/recipients
- 82% acceptance rate

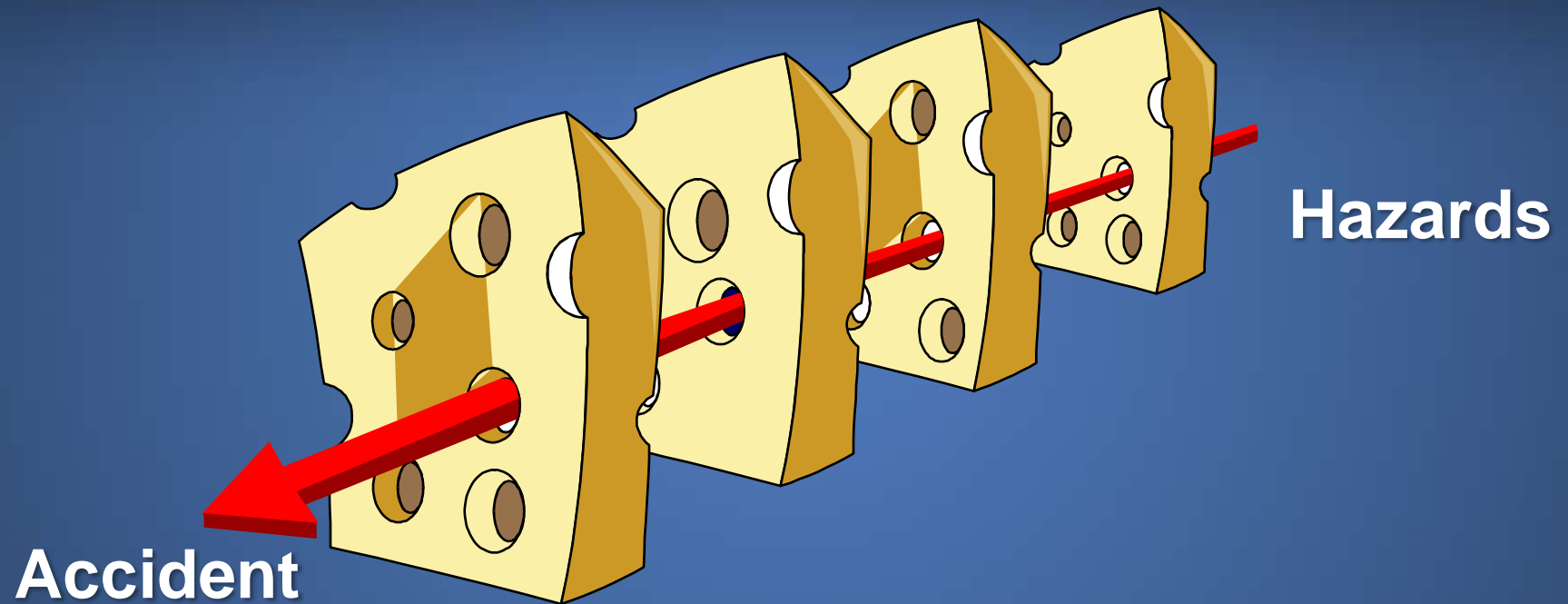


# 13,454 Safety Recommendations issued since 1967





# “Swiss Cheese” Model (Reason)



Successive layers of defenses, barriers, and safeguards

# Asiana 214 (July 6, 2013)

## San Francisco, CA (SFO)



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# NTSB Go Team: 24/7/365

- Individual investigator
- Regional/limited team
- Major launch/Board Member





# Key On-scene Events



## Organizational Meeting

- Designate parties and party coordinators
- Establish and organize groups

## Progress Meetings

- Summarize findings
- Info for briefings

## Family Briefings

## Press Briefings



# NTSB Investigative Process



## On-scene Investigation

Organizational Meeting  
Groups and Parties  
Progress meetings  
Media Briefings  
Press Releases



## Preliminary Report

Factual information



## Public Hearing

Fact finding  
Depositions  
Witnesses  
Docket



## Board Meeting

Docket  
Findings  
Conclusions  
Probable Cause  
Safety Recommendations



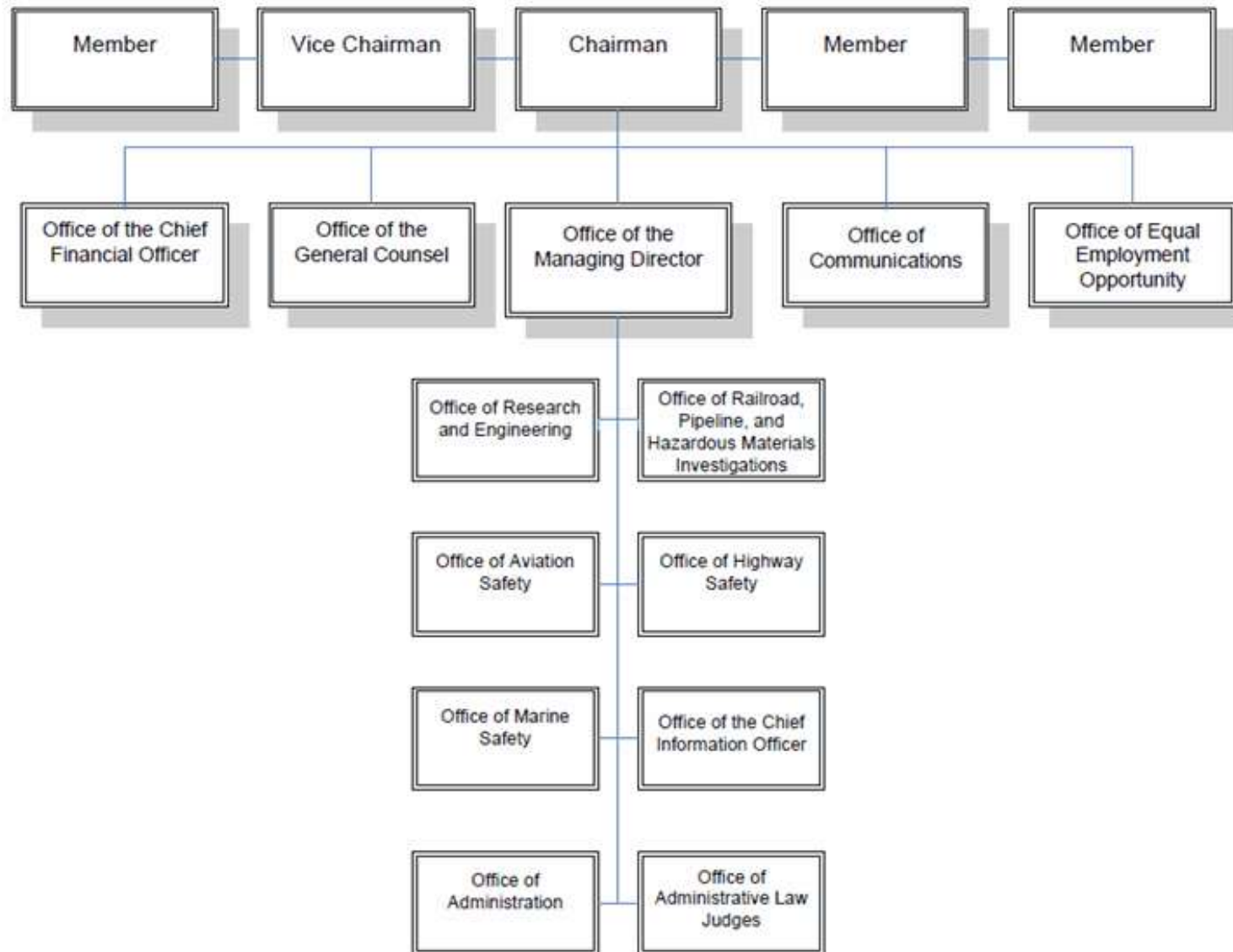
## Final Report

**Government in the Sunshine Act**



**NTSB**

# NATIONAL TRANSPORTATION SAFETY BOARD





# NTSB: The Board

- Five Members:
  - President nominates
  - Senate confirms



Mark Rosekind  
Member



Chris Hart  
Vice Chairman



Debbie Hersman  
Chairman



Robert Sumwalt  
Member



Earl Weener  
Member



# NTSB Characterized as:

‘moral compass and industry conscience’

NTSB Chairman Deborah A.P. Hersman



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Fatigue is a safety risk.





# Miami, Oklahoma (June 26, 2009) Fatigue Factors

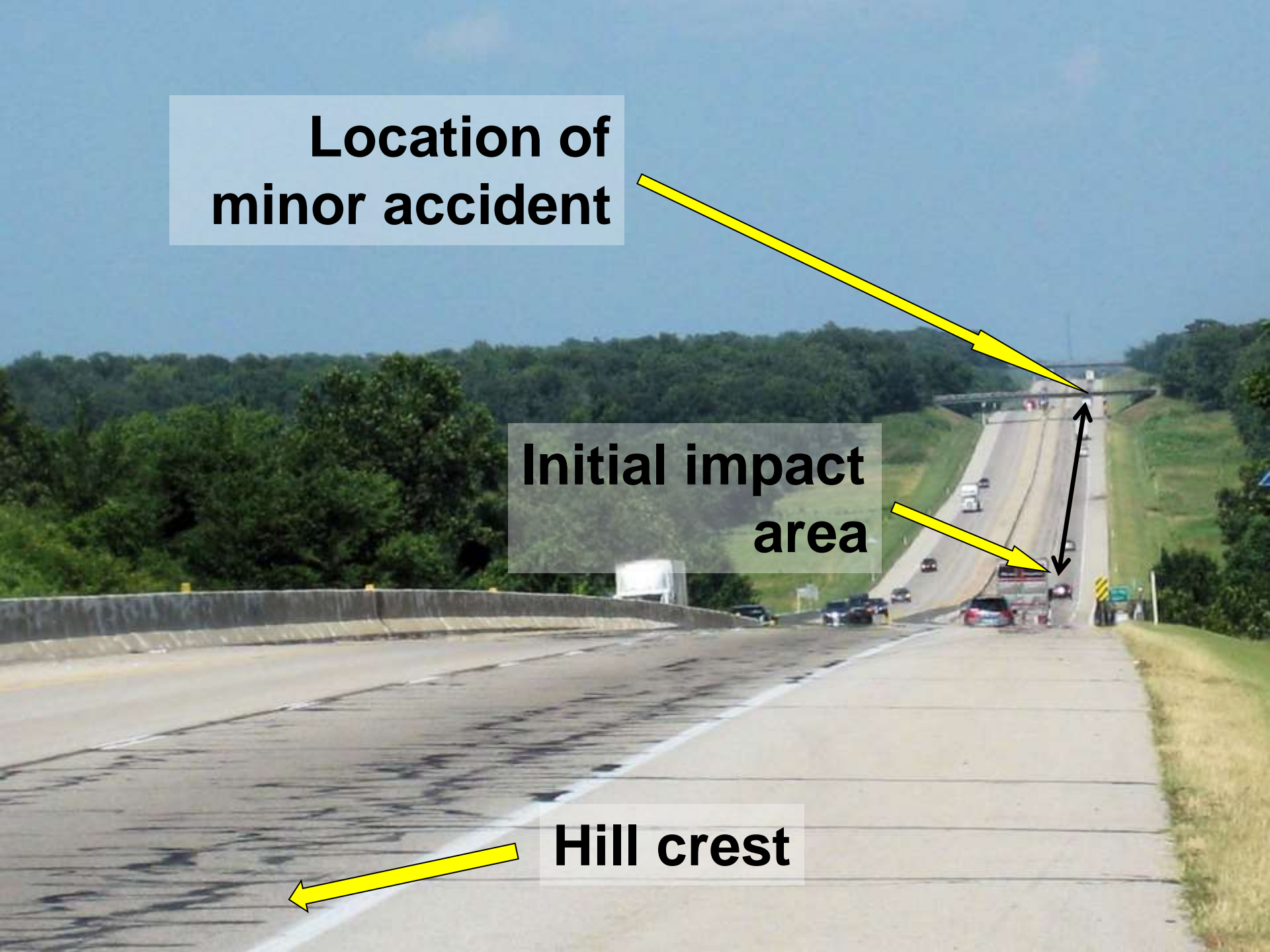
- Off work for 3 weeks: day active/night sleep schedule
- 3am to 3pm shift work/drive schedule (since 1997)
- Early bedtime (2 hr phase advance in sleep time)
- Obtained min 3 hrs/max 5 hrs sleep prior to accident
- Subsequently diagnosed with mild sleep apnea



**Location of  
minor accident**

**Initial impact  
area**

**Hill crest**





# Miami, OK (June 26, 2009)

10 fatalities  
3 serious injuries  
2 minor injuries  
5 no injuries

**Ford  
Windstar**



**Hyundai  
Sonata**

**Kia  
Spectra**

Source: Oklahoma State Police



# Probable Cause (fatigue)

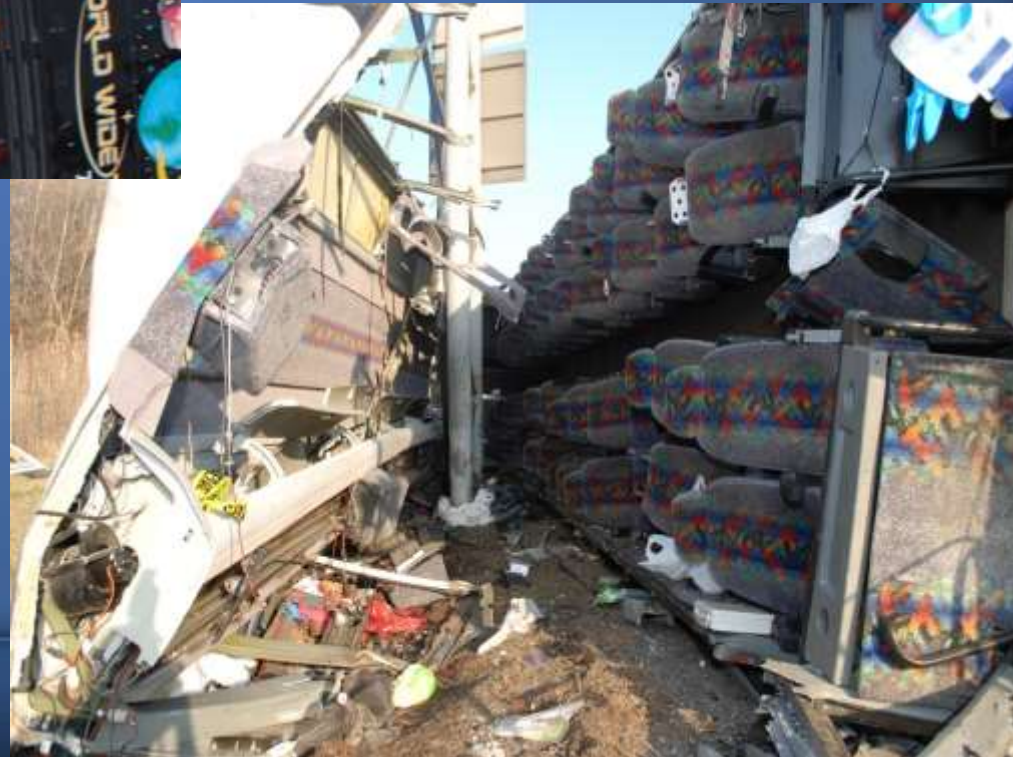
“ . . . driver’s fatigue, caused by the combined effects of acute sleep loss, circadian disruption associated with his shift work schedule, and mild sleep apnea, which resulted in the driver’s failure to react to slowing and stopped traffic ahead by applying the brakes or performing any evasive maneuver to avoid colliding with the traffic queue. . . . ”



# 'Bronx Bus', New York, NY (March 12, 2011)



15 fatalities  
17 injuries



# Probable Cause

“The National Transportation Safety Board determines that the probable cause of the accident was the motorcoach driver's failure to control the motorcoach due to fatigue resulting from failure to obtain adequate sleep, poor sleep quality, and the time of day at which the accident occurred.”



Multivehicle Collision  
Interstate 44 Eastbound  
Gray Summit, Missouri  
August 5, 2010



**Accident Report**

NTSB/HAR-11/03  
PB2011-916203



**National  
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**NTSB**



# GMC Driver Sleep Opportunities

**Table 14.** Summary of available sleep opportunity for GMC pickup driver, August 3–5, 2010.

Last Activity of Record	First Morning Activity	Total Time Available for Sleep
Aug 3, 12:00 a.m.	Aug 3, 5:00 a.m.	5 hr 00 min
Aug 3, 11:18 p.m.	Aug 4, 6:00 a.m.	6 hr 42 min
Aug 5, 1:00 a.m.	Aug 5, 5:52 a.m.	4 hr 52 min
		<b>Average: 5 hr 31 min</b>





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2 fatalities  
37 injuries



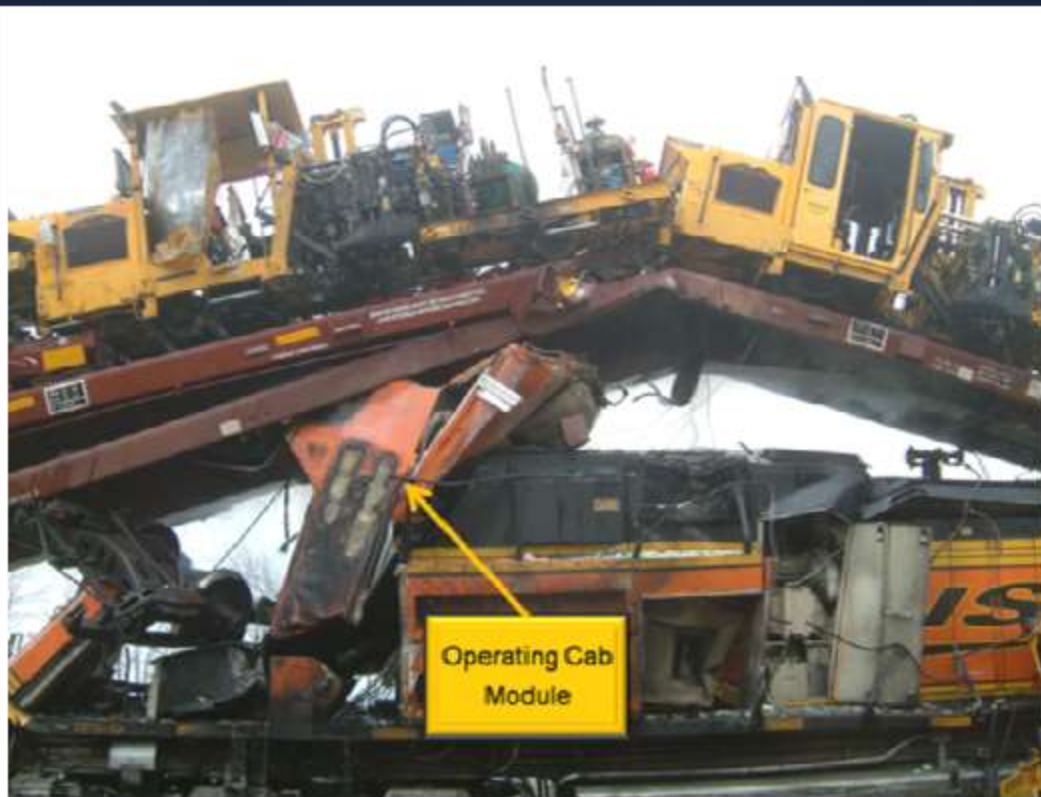
NTSB

# Findings: #9

The GMC pickup driver was fatigued at the time of the accident due to cumulative sleep debt and acute sleep loss, which could have resulted in impaired cognitive processing or other performance decrements.







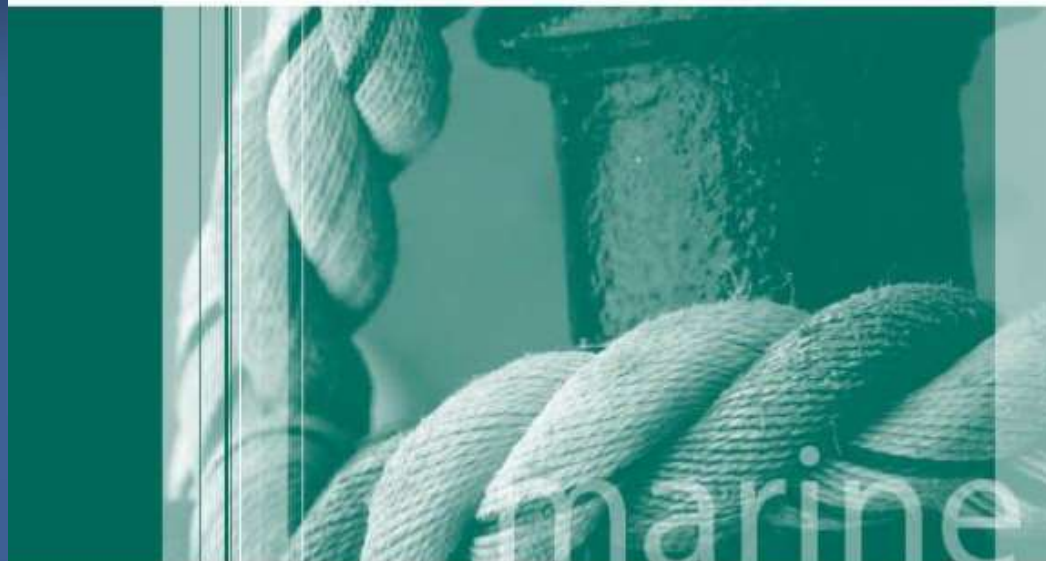
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# Probable Cause (fatigue)

“ . . . failure of the crew of the striking train to comply with the signal indication requiring them to operate in accordance with restricted speed requirements and stop short of the standing train because they had fallen asleep due to fatigue resulting from their irregular work schedules and their medical conditions.”



Collision of Tankship *Eagle Otome* with Cargo Vessel *Gull Arrow*  
and Subsequent Collision with the *Dixie Vengeance* Tow  
Sabine-Neches Canal, Port Arthur, Texas  
January 23, 2010



**Accident Report**

NTSB/MAR-11/04  
PB2011-916404



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# Collision: Eagle Otome



Photo U.S. Coast Guard



NTSB



# Collision: Eagle Otome

- Contributing to the accident was the first pilot's fatigue, caused by his untreated obstructive sleep apnea and his work schedule, which did not permit adequate sleep;



# Owatonna, MN (July 31, 2008)



8 fatalities



NTSB

# Owatonna Crew Fatigue Factors

- acute sleep loss (Capt/FO)
- cumulative sleep debt (FO)
- early start time (Capt/FO)
- excessive sleep need (Capt)
- insomnia (FO)
- self-medicate/prescription sleep med (FO)



# Probable Cause/Contributing Factors

“Contributing to the accident were . . .  
(2) fatigue, which likely impaired both  
pilots’ performance; . . .”



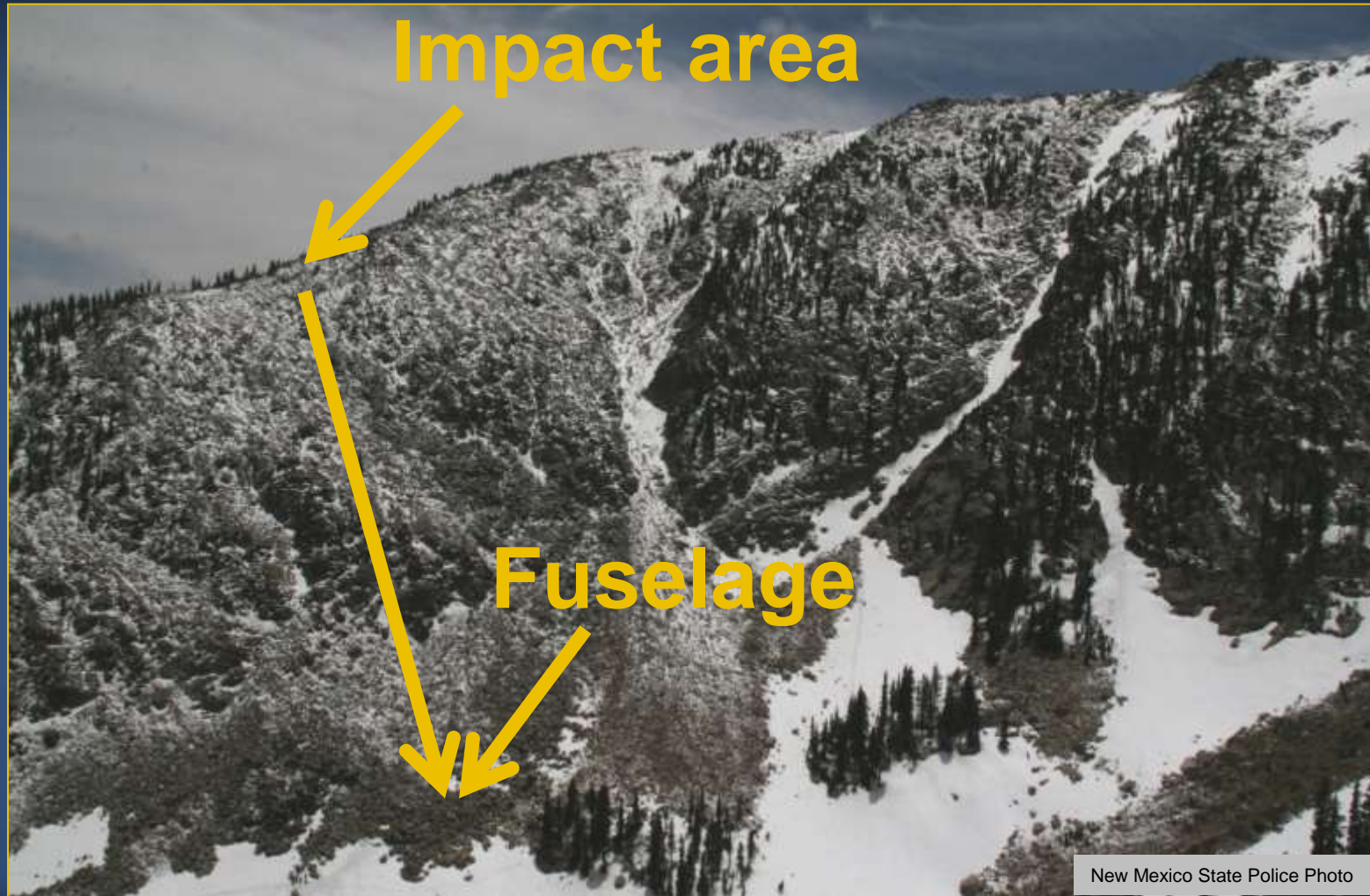


# New Mexico State Police Helicopter Sante Fe, New Mexico (June 9, 2009)



NTSB

# New Mexico State Police Helicopter Sante Fe, New Mexico (June 9, 2009)



NTSB

# New Mexico State Police Helicopter Sante Fe, New Mexico (June 9, 2009)

- Contributing to the accident were . . .  
the pilot's fatigue . . .
- Also contributing were . . .  
lack of an effective fatigue management  
program for pilots . . .



NTSB recommendations  
address fatigue.







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### MOST WANTED LIST

A program to increase the public's awareness of, and support for, action to adopt safety steps that can help prevent accidents and save lives. The following are ten of the current issues.



Addressing Human  
Fatigue



General Aviation  
Safety



Safety Management  
Systems



Runway Safety



Bus Occupant Safety



Pilot & Air Traffic  
Controller  
Professionalism



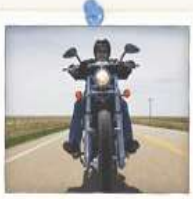
Recorders



Teen Driver Safety



Addressing Alcohol-  
Impaired Driving



Motorcycle Safety



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# NTSB Safety Recommendations: Fatigue

- MOST WANTED 1990 - 2011
- ~200 fatigue recommendations



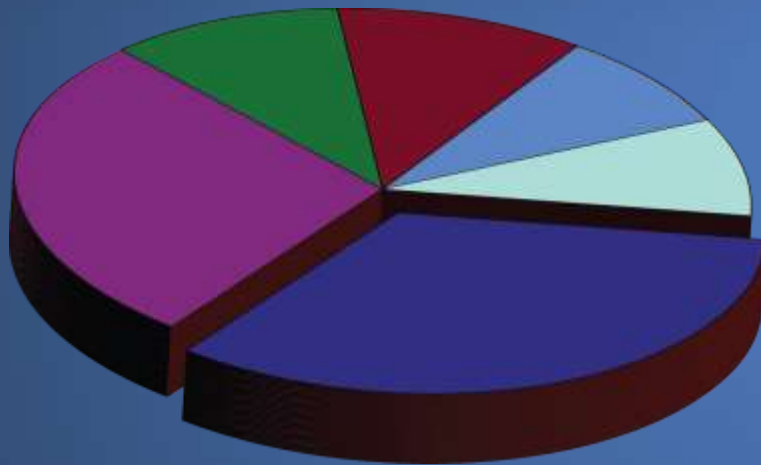
# NTSB Safety Recommendations: Fatigue

- 40 years ago: May 10, 1972
- “Revise FAR 135 to provide adequate flight and duty time limitations.” (A-72-55)
- Classified “Closed-Unacceptable”



# Complex Issue:

## Requires Multiple Solutions



- Scheduling Policies and Practices
- Education/Awareness
- Organizational Strategies
- Healthy Sleep
- Vehicle and Environmental Strategies
- Research and Evaluation





# NTSB Fatigue Recommendations: Education/Strategies

- Develop a fatigue education and countermeasures training program
- Educate operators and schedulers
- Include information on use of strategies: naps, caffeine, etc.
- Review and update materials



# Scheduling Policies and Practices

Victoria, Texas, January 2, 2008



Victoria, Texas Fire Department

- Day sleep, night drive, ~ 4 am WOCL



NTSB

# NTSB Fatigue Recommendations: Hours of Service / Scheduling

- Science-based hours of service
- Allow for at least 8 hours of uninterrupted sleep
- Fatigue mitigation strategies in the hours-of-service regulations for passenger-carrying drivers who operate during the nighttime window of circadian low
- Reduce schedule irregularity and unpredictability

# Sleep Apnea

Mexican Hat, UT, January 6, 2008



- 360 rollover, 50/53 ejected, 9 fatalities, OSA (-CPAP)



NTSB



# NTSB Fatigue Recommendations: Sleep Apnea/Health Related

- Develop standard medical exam to screen for sleep disorders; require its use
- Educate companies and individuals about sleep disorder detection and treatment, and the sedating effects of certain drugs
- Ensure drivers with apnea are effectively treated before granting unrestricted medical certification



# Owatonna, MN (July 31, 2008)



8 fatalities



NTSB

# Owatonna, MN (July 31, 2008): Safety Recommendations

7. Revise regulations and policies to permit appropriate use of prescription sleep medications by pilots under medical supervision for insomnia.
9. Review the policy standards for all common sleep-related conditions, including insomnia, and revise them in accordance with current scientific evidence to establish standards under which pilots can be effectively treated for common sleep disorders while retaining their medical certification.



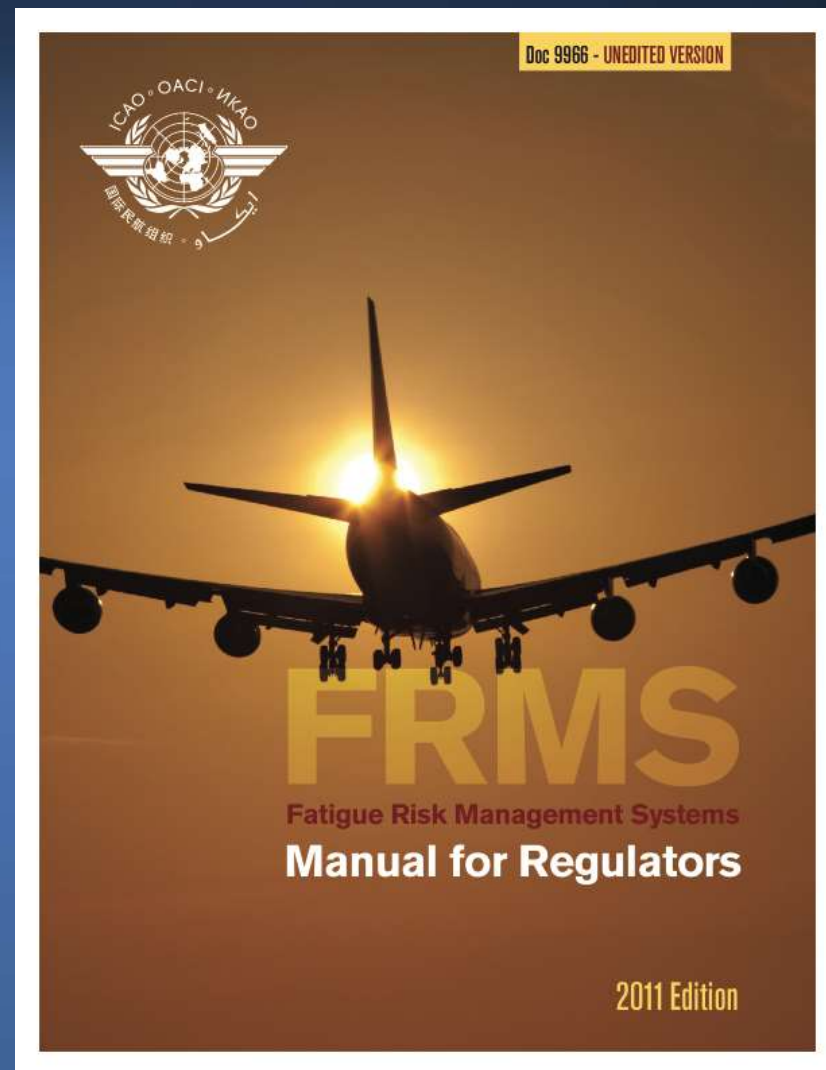
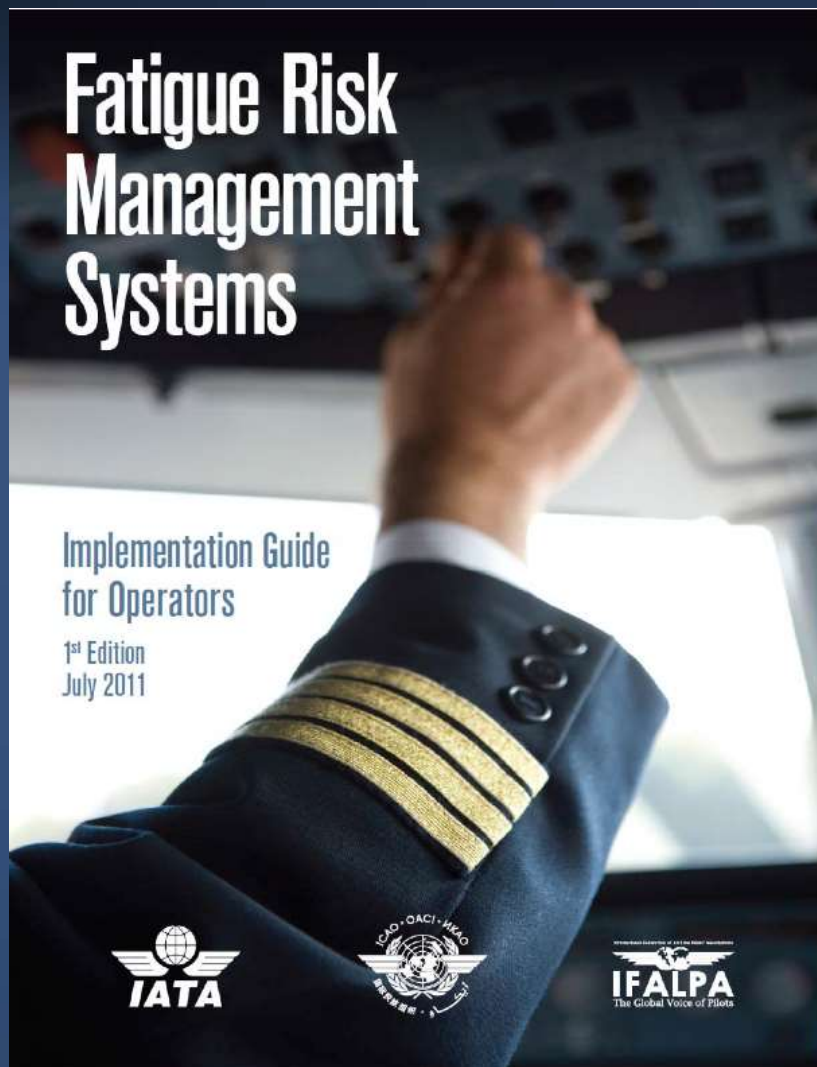
# NTSB Fatigue Recommendations: Fatigue Management Systems

- Develop guidance based on empirical and scientific evidence for operators to establish fatigue management systems
- Establish an ongoing program to monitor, evaluate, report on, and continuously improve fatigue management programs implemented by motor carriers to identify, mitigate, and continuously reduce fatigue-related risks for drivers.





# Examples



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# NTSB Safety Recommendations: Fatigue Status (May, 2012)

- Total: 194
- Open: 48
- Closed: 146
- CUN\*: 26

CUN = closed unacceptable



NTSB

# Manage Fatigue = Enhance Safety

- Promote culture change
- Educate everyone
- Acknowledge risks
- Take action!





# National Transportation Safety Board